

इंटरनेट

मानक

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Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 9322 (1980): Technical supply conditions for carbide tipped milling cutters [PGD 32: Cutting tools]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

TECHNICAL SUPPLY CONDITIONS FOR CARBIDE TIPPED MILLING CUTTERS

1. Scope — Covers the terminology, material, hardness and other requirements for carbide tipped milling cutters.

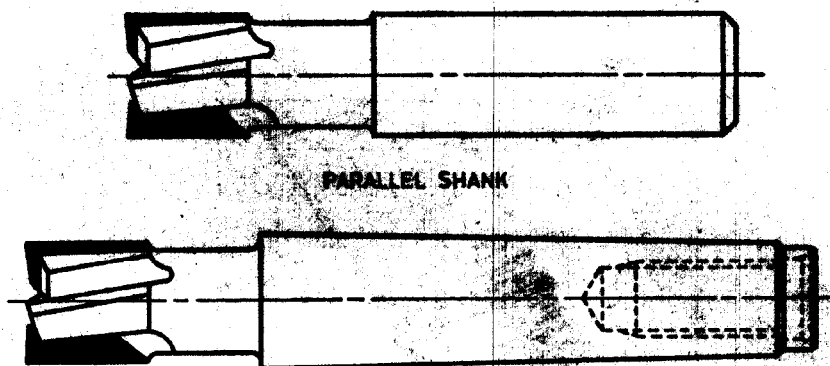
2. Terminology — For the purpose of this standard, the following definitions in addition to those explained in 2 of IS : 1830-1969 'Technical supply conditions for milling cutters' shall apply.

2.1 Carbide Tipped Milling Cutter — A rotary cutting tool provided with one or more cutting elements, brazed with carbide tips, called **teeth** which intermittently engage the workpiece and remove material by relative movement of workpiece and cutter.

2.2 Types of Carbide Tipped Milling Cutters

2.2.1 Shank-type carbide tipped milling cutters

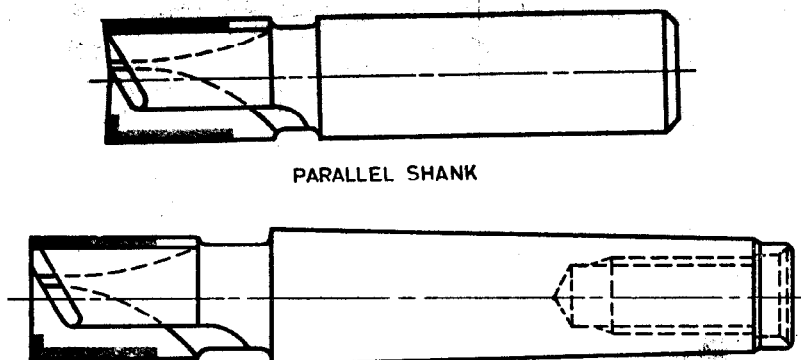
2.2.1.1 Carbide tipped end mills — A cutter with teeth having carbide tips on the periphery and end integral with a shank for holding and driving (see Fig. 1).



MORSE TAPER AND TAPPED END SHANK

FIG. 1 CARBIDE TIPPED END MILLS

2.2.1.2 Carbide tipped slot milling cutters — A cutter with teeth having carbide tips on the periphery and end integral with a shank for holding and driving, used mainly to mill slots (see Fig. 2).



MORSE TAPER AND TAPPED END SHANK

FIG. 2 CARBIDE TIPPED SLOT MILLING CUTTERS

2.2.1.3 Carbide tipped key-way milling cutters — A cutter with straight teeth or staggered teeth having carbide tips on the periphery and end integral with a shank for holding and driving, used mainly to mill key-ways (see Fig. 3).

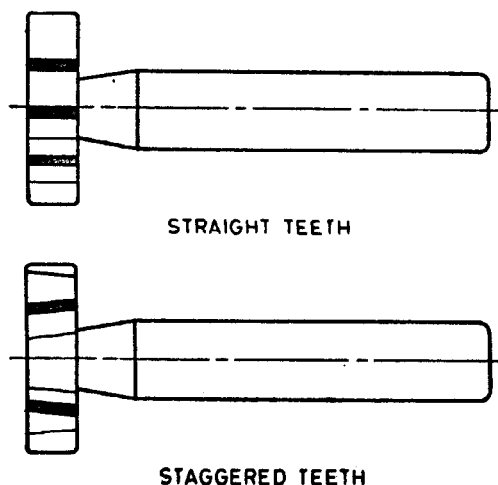


FIG. 3 CARBIDE TIPPED KEY-WAY MILLING CUTTERS, PARALLEL SHANK

2.2.1.4 Carbide tipped T-slot milling cutters — A cutter with teeth having carbide tips on the periphery and end integral with a shank for holding and driving, used mainly to mill T-slots (see Fig. 4).

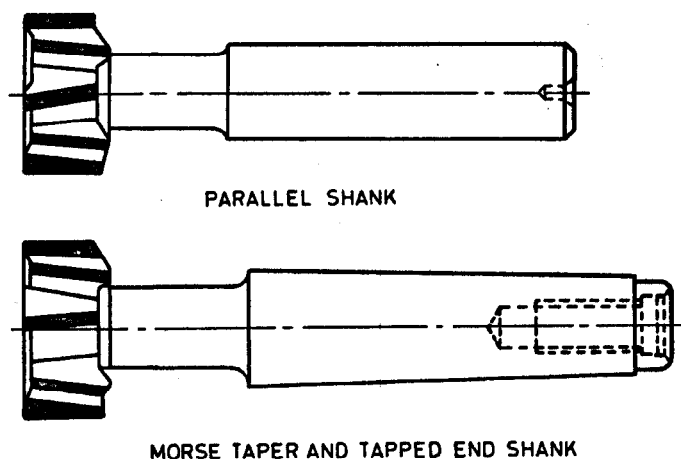


FIG. 4 CARBIDE TIPPED T-SLOT MILLING CUTTERS

2.2.1.5 Carbide tipped dove-tail milling cutters — A cutter with teeth having carbide tips on the periphery and end integral with a shank for holding and driving, used mainly to mill dove-tails (see Fig. 5 and 6).

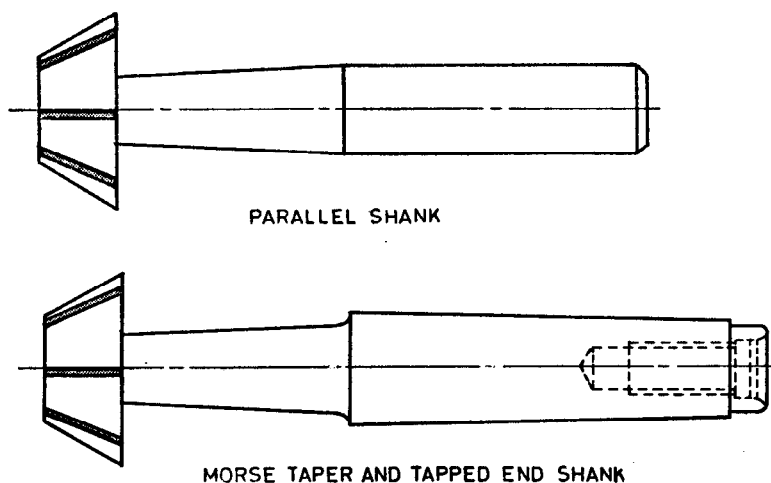


FIG. 5 CARBIDE TIPPED DOVE-TAIL MILLING CUTTERS

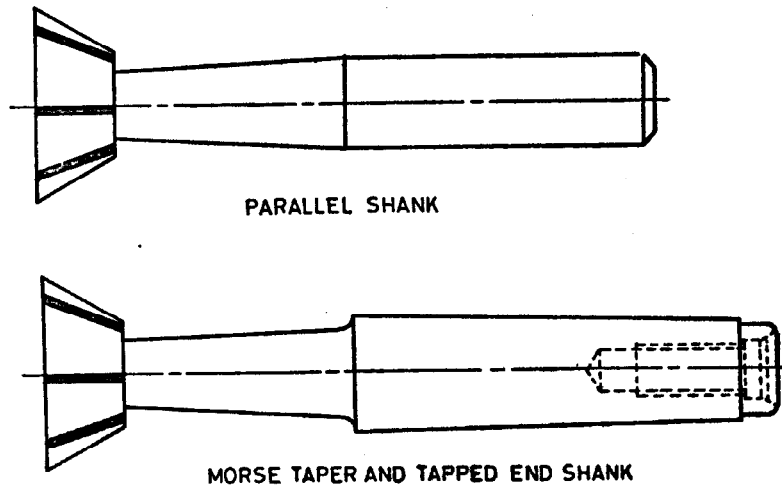


FIG. 6 CARBIDE TIPPED INVERSE DOVE-TAIL MILLING CUTTERS

2.2.2 Bore (arbor) type carbide tipped milling cutters

2.2.2.1 Carbide tipped side and face milling cutters — A bore type cutter with straight teeth or staggered teeth having carbide tips on the periphery and on both sides (see Fig. 7).

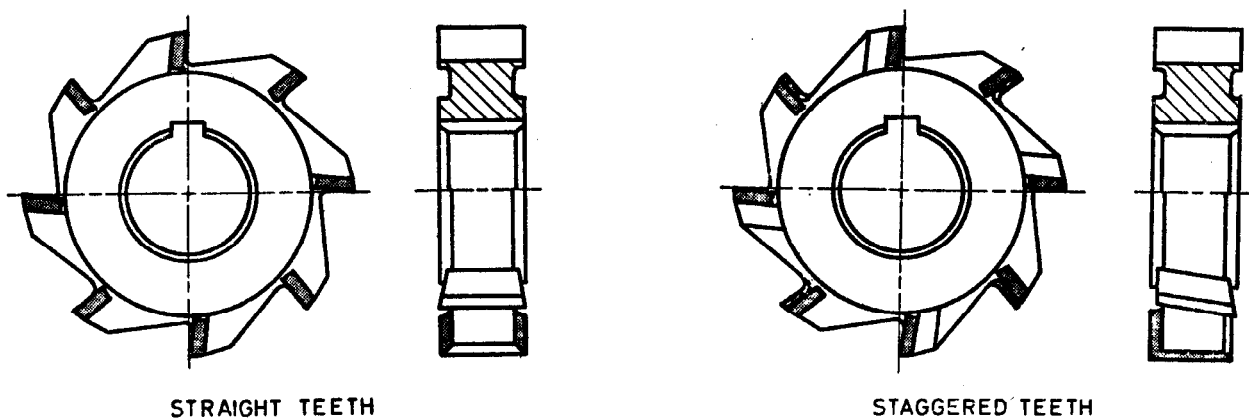


FIG. 7 CARBIDE TIPPED SIDE AND FACE MILLING CUTTERS

2.2.2.2 Carbide tipped shell end mills — A bore type cutter with teeth having carbide tips on the periphery and on one side only (see Fig. 8).

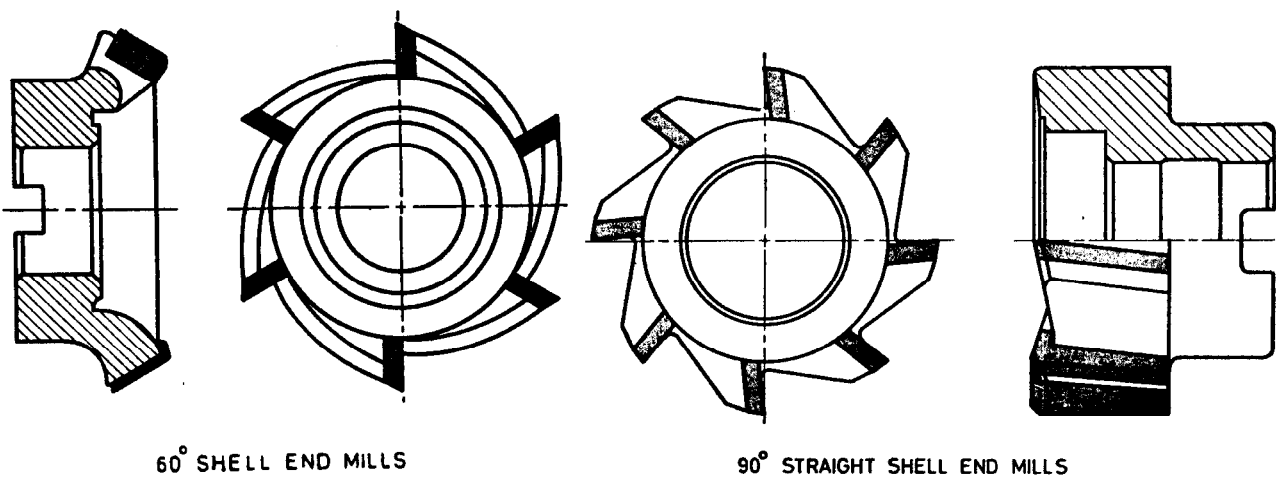


FIG. 8 CARBIDE TIPPED SHELL END MILLS

2.2.2.3 Carbide tipped angle milling cutters — A bore type cutter with circumferential teeth having carbide tips, the cutting edges of which lie on a conical surface (see Fig. 9).

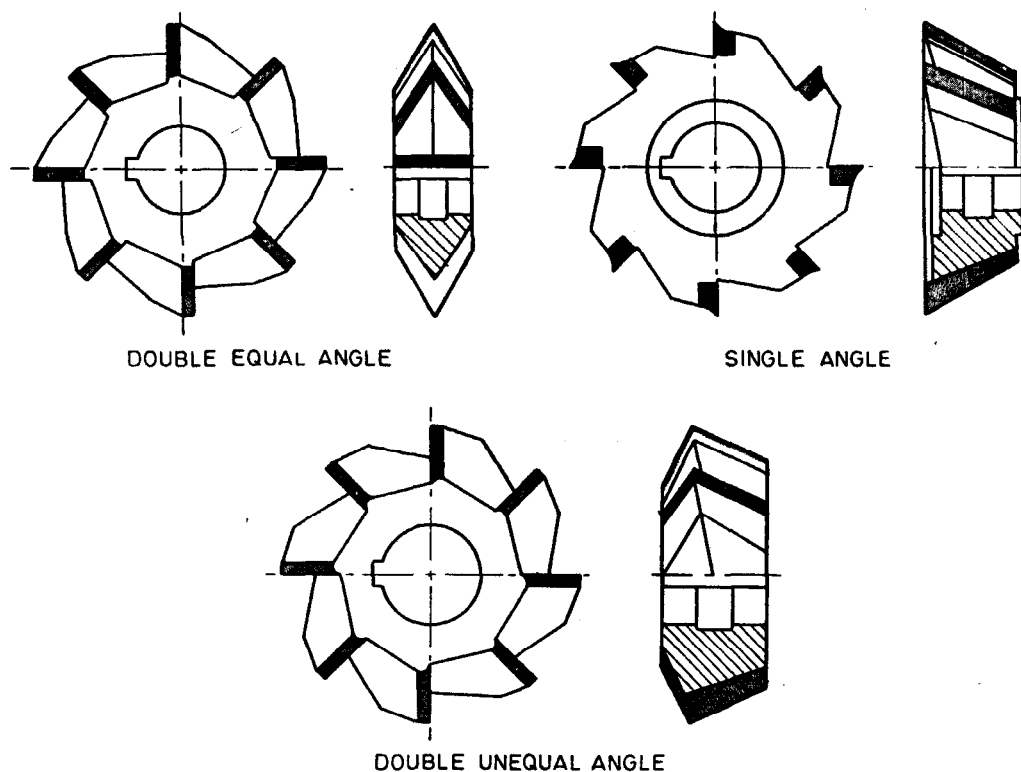


FIG. 9 CARBIDE TIPPED ANGLE MILLING CUTTERS

2.3 Elements of a Carbide Tipped Buttor and Related Terms — Various terms are illustrated in Fig. 10 and defined in subsequent clauses.

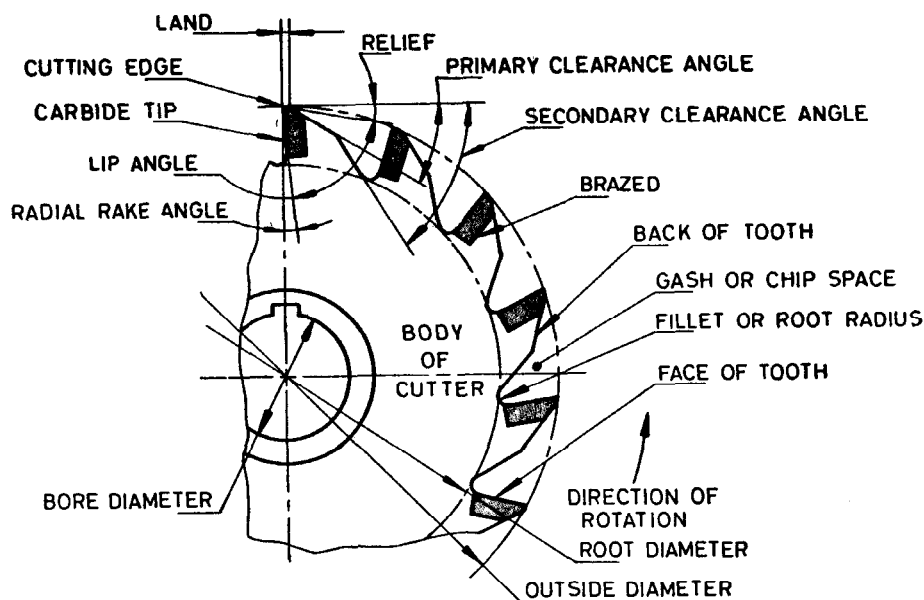


FIG. 10 ELEMENTS OF A CARBIDE TIPPED MILLING CUTTERS

2.3.1 Body — That part of the cutter left after exclusion of the tips and the portions to which the tips are attached.

2.3.2 Clearance angles — Angles formed by primary or secondary clearance and the tangent to the periphery of the cutter at the cutting edge. They are called the primary and secondary clearance angles, respectively.

2.3.3 Cutting edge — Edge formed by intersection of the face and the circular land or the surface left by the provision of primary clearance.

2.3.4 Face — That portion of the gash-adjacent, to the cutting edge on which the chip impinges, as it is cut from the work.

2.3.5 Fillet — Curved surface at the bottom of gash which joins the face of one tooth to the back of the tooth immediately ahead.

2.3.6 Gash (or chip space or flute) — Chip space between the back of one tooth and the face of the next tooth.

2.3.7 Land — That part of the back of tooth adjacent to the cutting edge which is relieved to avoid interference between the surface being machined and the cutter.

2.3.8 Lead — Axial advance of the helix of the cutting edge in one complete revolution of the cutter.

2.3.9 Lip angle — Included angle between the land and the face of the tooth, or alternatively the angle between the primary clearance and the face of the tooth.

2.3.10 Neck — Undercut, of cutters with a shank, between the cutting portion and the shank.

2.3.11 Outside diameter — Diameter of the circle passing through the peripheral cutting edge.

2.3.12 Rake angle axial (for helical teeth) — Angle between the line peripheral cutting edge and the axis of the cutter when looking radially at the point of intersection.

2.3.13 Rake angle (radial) — Angle in a plane perpendicular to the axis, between the face of the tooth and a radial line passing through the cutting edge.

2.3.14 Relief angle — Angle in a plane perpendicular to the axis between the land of a tooth and the tangent to the outside diameter of cutter at the cutting edge of that tooth.

2.3.15 Root diameter — Diameter of the circle passing through the bottom of the fillet.

2.3.16 Rotation for cutting

2.3.16.1 Left-hand cutter — The cutter rotating clockwise while cutting when viewed towards the spindle nose.

2.3.16.2 Right-hand cutter — The cutter rotating anticlockwise while cutting when viewed towards the spindle nose.

2.3.17 Shank — Parallel or tapered extension along the axis of the cutter employed for holding and driving.

3. Material

3.1 Cutting Portion (Carbide Tip) — The carbide tip shall be of a range of application suitable for the particular workpiece material as specified by the purchaser according to IS : 2428-1964 'Application of carbides for machining, ranges of application and colour code'.

3.2 Body — Carbon steel with tensile strength of not less than 700 MPa* (before construction).

4. Hardness

4.1 Shank/Body — 245 HV Min, beyond 25 mm from rear end of tip.

4.2 Tang — 320 to 450 HV.

5. General Requirements

5.1 Dimensions for morse taper shanks according to IS : 1715-1973 'Dimensions for self-holding tapers'.

5.2 Dimensions for centre holes according to IS : 2473-1975 'Dimensions for centre holes'.

5.3 Dimensions for parallel shanks for milling cutters according to IS : 8692-1978 'Dimensions for parallel shanks for milling cutters'.

5.4 The selection of carbide tips for machining various materials shall be according to IS : 2428-1964.

5.5 The milling cutters shall be well finished and ready for use. They shall be free from burrs, cracks and other surface defects.

5.6 All surfaces shall be finished smooth except those where fine surface finishes are required and indicated accordingly.

*1 MPa = 0.1 kgf/mm² (approx).

6. Tolerances

6.1 The permissible radial and axial runout values as applicable to carbide tipped milling cutters shall be given below:

All dimensions in millimetres.

Type of Cutter	Range of Nominal Diameter		Permissible Radial and Axial Runout (TIR*)		Testing Conditions
	Over	Up to and Including	Form Relieved	Profile Sharpened	
Carbide tipped milling cutters with bore (except key-way milling cutter)	1	50	0.07	0.05	Rotated on stationary test arbor
	50	120	0.10	0.07	
	120	250	0.12	0.10	
Carbide tipped milling cutters with shank (except woodruff key-way milling cutter and parallel shank and morse taper shank slot milling cutter)	1	50	0.07	0.05	Shank rotated in a V-Block and held between centres
	50	120	0.10	0.07	

*TIR → Total indicator reading.

6.2 Tolerances on other milling cutter dimensions shall be as specified in the relevant Indian Standard.

7. Marking — To be marked with the nominal size, range of application of carbide tip, manufacturer's name and trade-mark.

8. Packing

8.1 Each milling cutter shall be covered with a suitable rust-proof coating and packed in a non-absorbent paper.

8.2 Each milling cutter or a number of milling cutters shall be wrapped in non-absorbent paper protected by a cover bearing the nominal size, range of application of carbide tip and the manufacturer's name or trade-mark.

EXPLANATORY NOTE

This standard is one of a series of Indian Standards on carbide tipped milling cutters. The following standards are also being issued simultaneously:

IS : 9323-1979 Specification for carbide tipped end mills with parallel shanks

IS : 9324-1979 Specification for carbide tipped end mills with morse taper and tapped end shanks

IS : 9325-1979 Specification for carbide tipped slot milling cutters with parallel shanks

IS : 9326-1979 Specification for carbide tipped slot milling cutters with morse taper and tapped end shanks

Other related standards are as follows:

IS : 8611-1977 Technical supply conditions for milling arbors and accessories

IS : 8612-1977 Milling arbors with morse taper and positive drive

IS : 8613-1977 Stub milling arbors with morse taper and positive drive

IS : 8614-1977 Milling arbors with self-release 7/24 taper

IS : 8615-1977 Stub milling arbors with self-release 7/24 taper

IS : 8616-1977 Stub milling arbors with self-release 7/24 taper with key

IS : 8617-1977 Stub milling arbors with morse taper and with key

IS : 8618-1977 Spacing collars for milling arbors

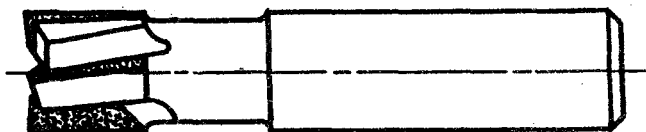
IS : 8619-1977 Bearing collars for milling arbors

IS : 8620-1977 Clamping nuts for milling arbors

IS : 8621-1977 Retaining screw for milling arbors

AMENDMENT NO. 1 OCTOBER 1998
TO
IS 9322 : 1980 TECHNICAL SUPPLY CONDITIONS
FOR CARBIDE TIPPED MILLING CUTTERS

(*Page 1, clause 2.2.1.1*) — Substitute the following figure in place of existing Fig. 1.



PARALLEL SHANK



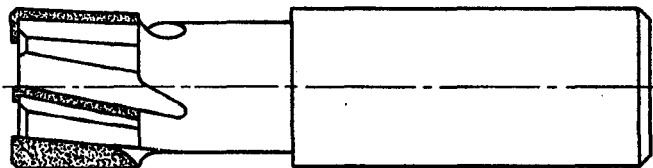
MORSE TAPER AND TAPPED END SHANK

FIG. 1 CARBIDE TIPPED END MILLS

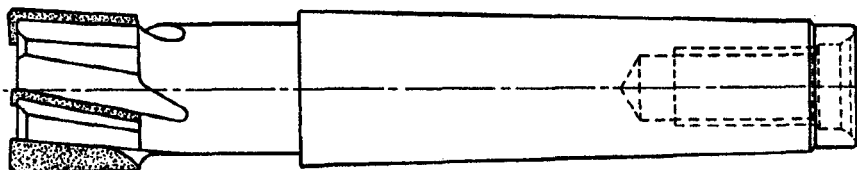
(*Page 4, clause 2.3*) — Substitute the word 'Cutter' for 'Butter'.

**AMENDMENT NO. 2 MAY 2002
TO
IS 9322 : 1980 TECHNICAL SUPPLY CONDITIONS FOR
CARBIDE TIPPED MILLING CUTTERS**

[Page 1, Fig. 1 (see also Amendment No. 1) — Substitute the following for the existing figure:



PARALLEL SHANK



MORSE TAPER AND TAPPED END SHANK

FIG. 1 CARBIDE TIPPED END MILLS